CareerUdaya

Rise with Purpose

Geography

Complete Notes

For APSC Prelims & Mains

APSC CCE | Prelims | Mains | SVG Maps | Revision

Rise with Purpose

PREPARED BY

CareerUdaya Editorial Team

Physical & world geography in simple language - with labelled SVG diagrams, MCQs and Mains answers

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CHAPTER 1

Interior of the Earth

What it means

We can never dig down to the centre of the Earth, so geographers study its interior using clues. Some clues are direct (things we can touch), but most are indirect - especially earthquake (seismic) waves, which behave differently as they pass through different layers.

In simple words

Think of the Earth like a boiled egg you cannot open: a thin shell (crust), a thick white (mantle) and a yolk (core). Since we cannot crack it open, scientists 'listen' to earthquake waves passing through it - the way the waves bend and disappear tells us what each layer is made of.

Key concepts

Direct sources

Volcanic eruptions (lava is cooled magma from inside), mining of ores and minerals, deep drilling, and the surface rocks themselves - all let us directly sample the Earth's material.

Indirect sources

Temperature (rises about 1°C every 32 m of depth, from radioactivity and the insulating outer layer), pressure (rises with the overlying load), meteorites, gravity anomalies (gravity differs by place, showing different rocks), and above all seismic waves.

Seismic waves - surface vs body

Surface waves travel along the top: Love (L) waves move horizontally, Rayleigh (R) waves move both ways and cause the most surface damage. Body waves travel through the inside: P-waves and S-waves.

P-waves and S-waves

P-waves (primary, 10-12 km/s) pass through both solid and liquid; they vanish between 103° and 143° from the focus - the P-wave shadow zone. S-waves (secondary, 5-6 km/s) pass through solids only and disappear beyond 103° - the S-wave shadow zone. This proved the outer core is liquid.

Chemical layers (SIAL-SIMA-NIFE)

Crust = silicon + aluminium (SIAL), light (2-3 g/cc). Mantle = silicon + magnesium (SIMA), to 2900 km, with the semi-molten asthenosphere on top. Core = nickel + iron (NIFE), heavy (13-17 g/cc); the outer core is molten (to 5160 km) and the inner core is solid (to 6371 km).

Diagrams

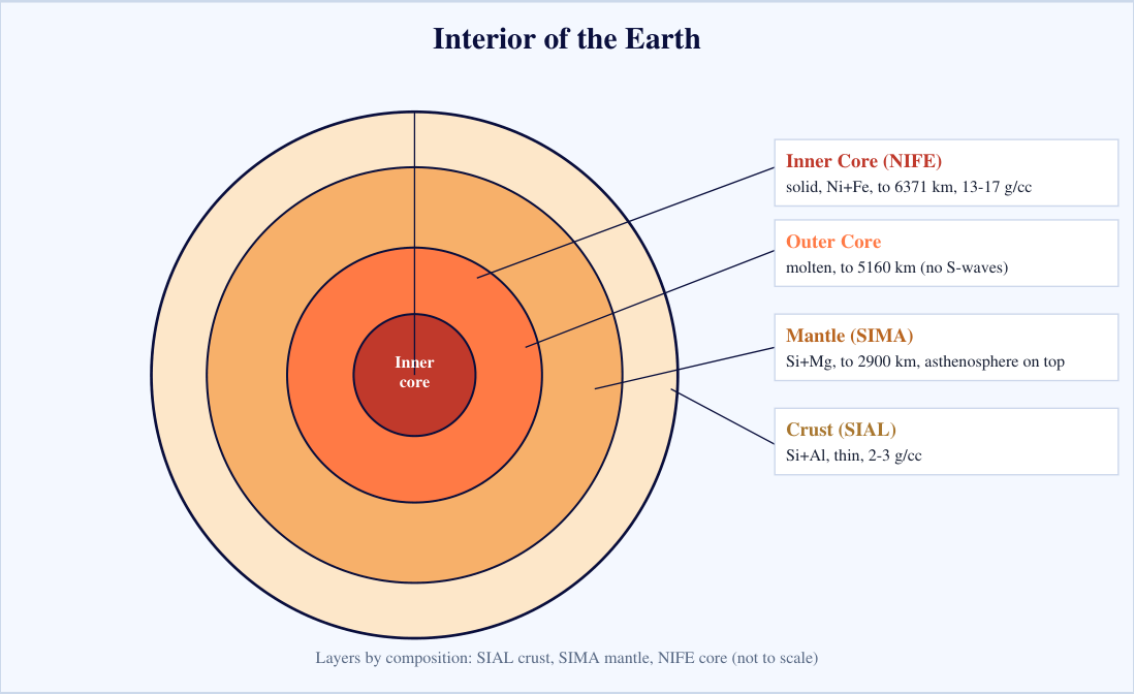

Fig: Interior of the Earth

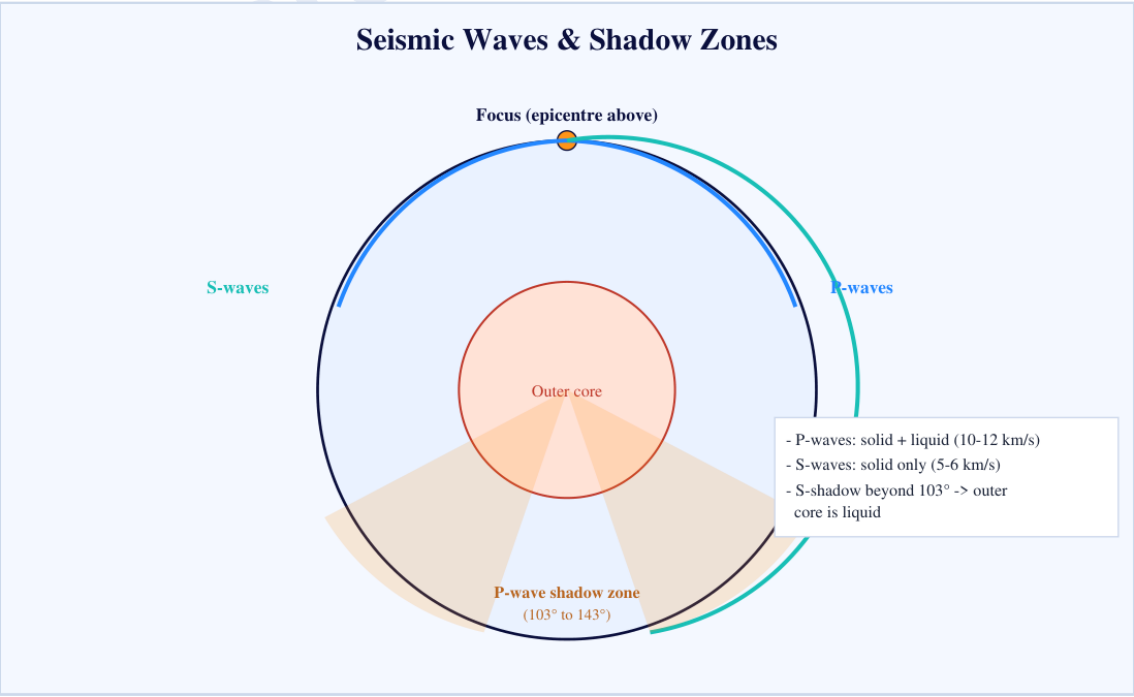

Fig: Seismic Waves & Shadow Zones

The Earth's layers at a glance

Layer	Composition	State / depth
Crust (SIAL)	Silicon + Aluminium	Solid, thin, 2-3 g/cc
Mantle (SIMA)	Silicon + Magnesium	Semi-molten top (asthenosphere), to 2900 km
Outer Core	Nickel + Iron	Molten, to 5160 km (no S-waves)

Inner Core (NIFE)	Nickel + Iron	Solid, to 6371 km (Lehmann)

APSC Exam Tips

Score boosters

- P-waves through solid+liquid, S-waves through solid only - this single fact explains both shadow zones.
- P-wave shadow = 103° to 143°; S-wave shadow = beyond 103°. Memorise the numbers.
- The liquid outer core is the reason S-waves disappear - a classic statement question.
- SIAL-SIMA-NIFE is the fastest way to recall crust-mantle-core composition.

Quick Revision

Interior of the Earth - recap

- Direct sources: volcano, mining, drilling, surface rocks.
- Indirect: temperature, pressure, gravity, meteorites, seismic waves.
- P-waves: solid+liquid; S-waves: solid only.
- Crust=SIAL, Mantle=SIMA, Core=NIFE; outer core liquid, inner core solid.

CHAPTER 2

Continental Drift & Plate Tectonics

What it means

Why do the coastlines of South America and Africa look like jigsaw pieces? Alfred Wegener answered this in 1912 with the Continental Drift theory, which later grew into the modern theory of Plate Tectonics.

In simple words

Imagine the continents as giant rafts floating on a thick, slow-moving 'syrup' (the asthenosphere). Over millions of years these rafts have drifted apart - which is why their edges still seem to fit together like a puzzle.

Key concepts

Wegener's idea (1912)

Once there was a single supercontinent, Pangaea, surrounded by a single ocean, Panthalassa. About 200 million years ago it split into Laurasia (north) and Gondwana (south), with the Tethys Sea between them. Laurasia became North America and Eurasia; Gondwana became South America, India-Australia and Antarctica.

Evidence for drift

Jigsaw fit (Brazil's bulge fits the Gulf of Guinea), matching fossils (Glossopteris plants and marsupials across continents), and matching rocks/placer deposits (eastern Brazil and western Africa). These suggest the lands were once joined.

Criticism of drift

Fold mountains also exist on eastern coasts (Great Dividing Range), islands exist on western sides too (UK, Ireland), not all continents fit, similar life can result from similar climate, and the Moon's pull is far too weak to move continents.

Plate tectonics

A plate is the crust plus the solid upper mantle. Plates move and adjust; their movement is plate tectonics. There are seven major plates (Pacific, North American, South American, African, Eurasian, Antarctic, and the Indo-Australian) and several minor ones (Nazca, Cocos, Arabian, Caribbean, Philippine, Juan de Fuca, Somali, India).

Plate boundaries

Convergent (plates collide) - destructive, forming fold mountains, trenches and volcanoes; three sub-types: continental-continental (Himalaya), continental-oceanic (Andes, Rockies, Pacific Ring of Fire) and oceanic-oceanic (island arcs, trenches). Divergent (plates move apart) - constructive, forming ridges (Mid-Atlantic Ridge).

Diagrams

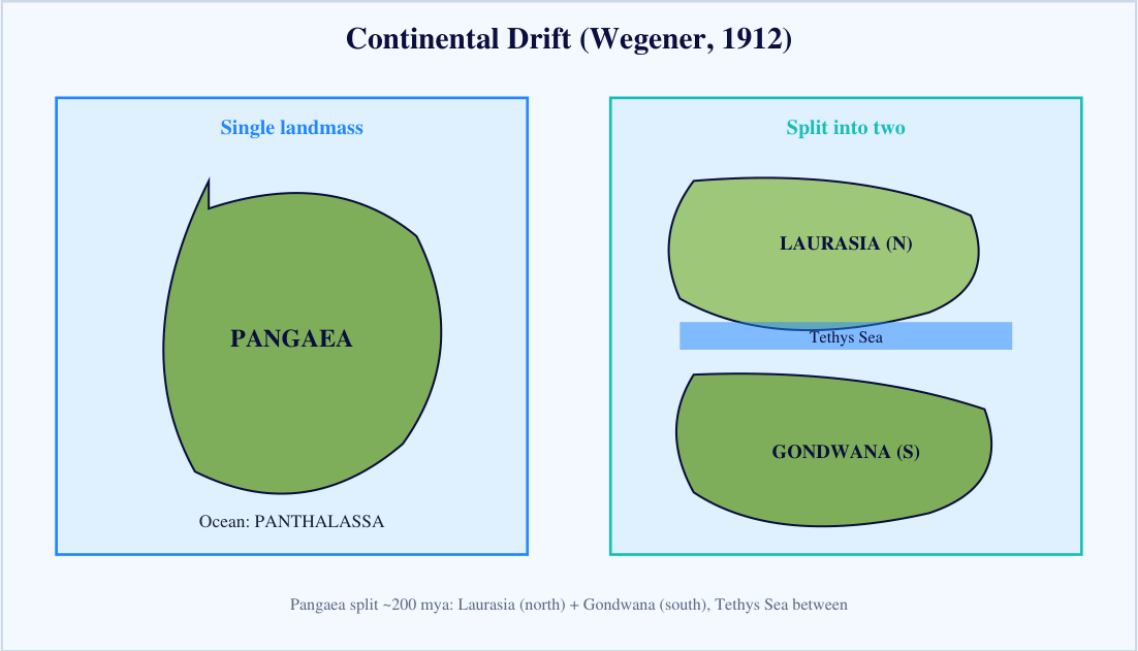

Fig: Continental Drift (Pangaea)

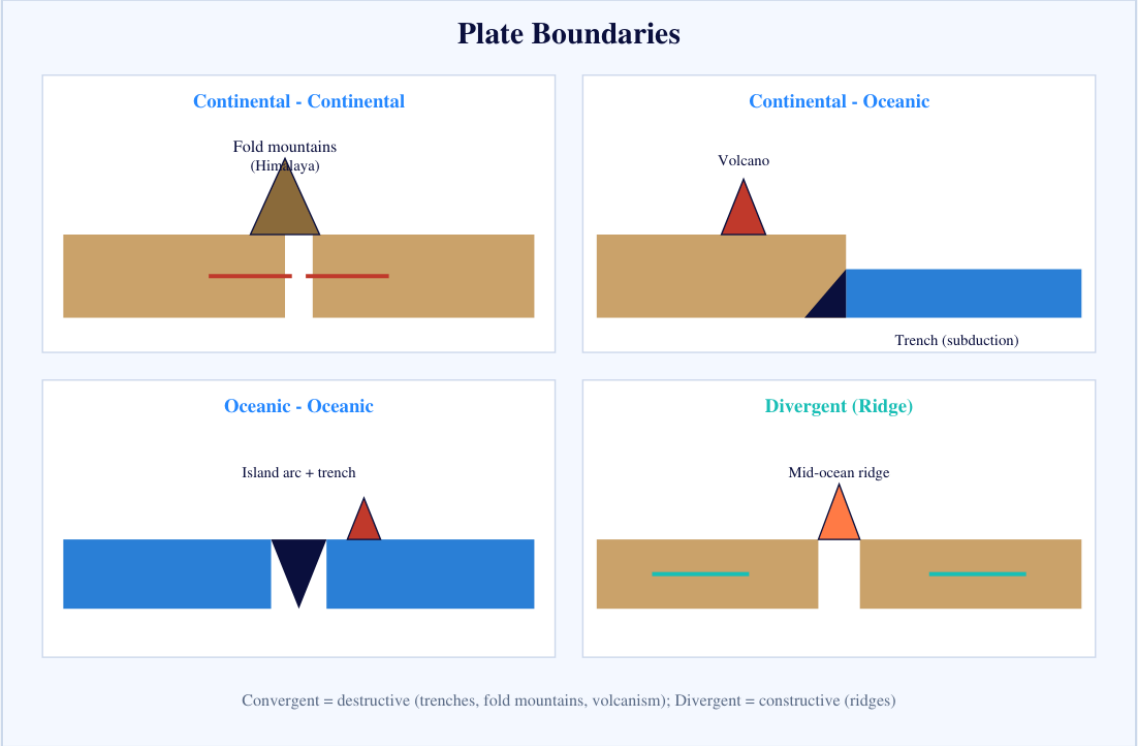

Fig: Plate Boundaries

APSC Exam Tips

Score boosters

- Pangaea -> Laurasia (N) + Gondwana (S), separated by the Tethys Sea.
- Himalaya = continental-continental convergence (Indian plate subducted under Eurasian).
- Convergent = destructive; Divergent = constructive (ridges).
- Know the 7 major plates - the Indo-Australian (or India) plate is a favourite.

Quick Revision

Continental Drift & Plate Tectonics - recap

- Wegener 1912: Pangaea + Panthalassa -> Laurasia + Gondwana (Tethys).
- Evidence: jigsaw fit, fossils (Glossopteris), matching rocks.
- Plate = crust + solid upper mantle.
- Convergent (destructive) vs Divergent (constructive, ridges).

CHAPTER 3

Earthquakes

What it means

An earthquake is a sudden shaking of the Earth's surface caused by a rapid release of energy as seismic waves. Most are linked to the movement of tectonic plates.

In simple words

Bend a stick until it snaps - the sudden release of energy makes your hands jolt. The Earth does the same: stress builds up along plate edges until the rocks snap, and the released energy shakes the ground.

Key concepts

Causes

Plate tectonics (movement/adjustment of plates), elastic rebound (e.g. water from a dam percolating and pressuring the rock, as at Koyna), human-induced causes (nuclear tests, mining), and landslides/avalanches.

Effects

Destruction of life and property, floods (from sea-level rise or dam damage), fires (broken gas/electric lines), changes in river courses, and tsunamis affecting coasts.

Key terms

Focus/hypocentre = point of origin below the surface; Epicentre = point directly above on the surface; Richter scale = magnitude (energy, 0-9); Mercalli scale = intensity (1-12); Seismograph measures it, and the printed record is a seismogram.

World earthquake zones

Pacific Ring of Fire (Circum-Pacific belt) - the most earthquake-prone, from convergence; Mid-Atlantic Ridge - from divergence; Mid-continental belt - from the Alps to the Malay Peninsula, from continental collision.

India's seismic zones

Zone V (highest risk) - Himalayas, north-east India and the Rann of Kutch; Zone IV - other north Indian states; Zone III - parts of the peninsula; Zone II (lowest risk) - the stable Karnataka/Telangana plateau.

Earthquake scales

Scale	Measures	Range
Richter	Magnitude (energy)	0 to 9
Mercalli	Intensity (felt effect)	1 to 12

APSC Exam Tips

Score boosters

- Focus is below the surface; epicentre is directly above it.
- Richter = magnitude/energy; Mercalli = intensity - don't swap them.
- Zone V (Himalaya + NE India + Kutch) is India's most seismically active.
- The Pacific Ring of Fire is both the top earthquake AND volcano belt.

Quick Revision

Earthquakes - recap

- Causes: plate tectonics, elastic rebound (Koyna), human, landslides.
- Focus = origin (underground); Epicentre = surface point above.
- Richter (0-9) magnitude; Mercalli (1-12) intensity.
- Zone V = Himalaya, NE India, Rann of Kutch (highest).

CHAPTER 4

Volcanism

What it means

Volcanism is the whole process by which molten material from inside the Earth erupts to the surface and solidifies. Magma is the molten material inside; once it reaches the surface it is called lava.

In simple words

Shake a fizzy drink and open it - the pressure forces liquid out through the narrow opening. A volcano is similar: pressure pushes magma up through a vent (the volcano) until it bursts out as lava, gas and ash.

Key concepts

Causes

Mostly plate tectonics: at continental-oceanic and oceanic-oceanic convergence the subducted plate melts and erupts; at divergence, lava fills the gap. Earthquakes can also open fractures through which magma escapes.

Materials erupted

Gases (CO_2, SO_2, NO_2, CH_4, water vapour - 'degassing'), solids called pyroclastic material (lapilli - peanut-sized; scoria - boulder-sized; pumice - porous rock; volcanic bombs; tephra; breccia), and liquid lava.

Acidic vs basic lava

Acidic lava - high silica, high viscosity, low fluidity, very explosive, builds steep conical landforms, light coloured (granite). Basic lava - low silica, low viscosity, high fluidity, less explosive, builds gentle slopes, dark coloured (basalt).

Landforms

Extrusive (above ground): cinder cone, composite cone, parasitic cone, crater, caldera (enlarged crater), geyser (e.g. Old Faithful, Yellowstone), hot springs, archipelago. Intrusive (below ground): dyke (vertical), sill (horizontal), phacolith, lopolith (saucer), laccolith (dome/mushroom), batholith (large mass).

Regions

Pacific Ring of Fire (Fuji, Kilauea, Cotopaxi), Mid-Continental Belt (Vesuvius, Stromboli - the 'lighthouse of the Mediterranean', Krakatoa), Mid-Atlantic Ridge (St Helena), and the Great African Rift Valley (Kilimanjaro, Kenya). In India: Barren Island (active) and Narcondam (extinct) near the Andamans, and the Deccan Traps.

Acidic vs Basic lava

Property	Acidic lava	Basic lava
Silica	High	Low
Viscosity / fluidity	High / low	Low / high
Explosiveness	Very explosive	Less explosive
Landform	Steep cone	Gentle slope
Example rock	Granite (light)	Basalt (dark)

APSC Exam Tips

Score boosters

- Barren Island = India's only ACTIVE volcano; Narcondam = extinct.
- Intrusive landforms: laccolith=dome, lopolith=saucer, dyke=vertical, sill=horizontal.
- Acidic lava = steep cones & explosive; basic lava = gentle & flowing.
- Stromboli is the 'Lighthouse of the Mediterranean'.

Quick Revision

Volcanism - recap

- Magma (inside) -> Lava (surface); vent = volcano.
- Pyroclasts: lapilli, scoria, pumice, bombs, tephra, breccia.
- Acidic = steep/explosive/granite; Basic = gentle/fluid/basalt.
- India: Barren (active), Narcondam (extinct), Deccan Traps.

CHAPTER 5

Rocks, Folding & Faulting

What it means

The solid Earth is made of three rock families, and the crust is constantly bent and broken by internal forces - producing folds (bends) and faults (cracks) that build mountains and valleys.

In simple words

Push a rug from both ends and it wrinkles up into folds; pull a cracked board apart and one piece drops - that is faulting. The same squeezing and pulling forces shape the Earth's crust.

Key concepts

Three rock types

Igneous - formed by cooling magma (intrusive like granite/gabbro, or extrusive). Sedimentary - layered (stratified) rocks formed from weathered sediments; they contain fossils. Metamorphic - old rocks changed by heat/pressure (limestone->marble, coal->graphite, shale->schist, clay->slate, quartz->quartzite).

Folding

A fold is a bend in the crust, caused by compression of softer/sedimentary rocks. Types (remember SAMIR): Symmetrical (equal limbs - Jura), Asymmetrical (one limb shorter - Pyrenees), Monoclinal (one steep side - Colorado), Isoclinal (parallel limbs), Recumbent (limbs and axis horizontal - Alps), and Nappe (upper limb pushed over the lower).

Faulting

A fault is a crack from tension or compression. Normal fault (tension) - a block sinks under gravity, forming a rift valley (graben) with raised block mountains (Great African Rift Valley). Reverse fault (compression) - a block is pushed up.

Block mountains & rift valleys

The raised part of a fault is a block mountain (horst); the sunken part is a rift valley (graben). The East African Rift, Mount Virunga and Monte Tomba are classic examples.

Metamorphism: parent -> product

Parent rock	Metamorphic rock
Limestone	Marble
Coal	Graphite
Shale	Schist
Clay	Slate
Quartz	Quartzite

APSC Exam Tips

Score boosters

- Sedimentary rocks are the ones that contain fossils (stratified layers).
- Use SAMIR for fold types: Symmetrical, Asymmetrical, Monoclinal, Isoclinal, Recumbent (+ Nappe).
- Normal fault = tension -> rift valley; Reverse fault = compression.
- Memorise the metamorphism pairs - limestone->marble is a favourite.

Quick Revision

Rocks, Folding & Faulting - recap

- Igneous (magma), Sedimentary (layered, fossils), Metamorphic (heat/pressure).
- Fold = bend (compression); Fault = crack (tension/compression).
- Block mountain (horst) up, Rift valley (graben) down.
- East African Rift = normal faulting.

CHAPTER 6

Weathering, Erosion & Rivers

What it means

Weathering breaks rocks in place; erosion wears them away and carries the pieces off. Rivers are the greatest sculptors of the land, and they shape it differently as they grow older.

In simple words

Weathering is like bread going stale and crumbling where it sits; erosion is the wind then blowing the crumbs away. A river is young and energetic in the hills (cutting deep valleys) and old and lazy on the plains (dropping its load to build deltas).

Key concepts

Weathering types

Physical (exfoliation/peeling from day-night heating, frost-thaw, repeated wetting-drying), Chemical (carbonation - CO2 + water dissolves limestone into caverns/sinkholes; oxidation - iron rusts and crumbles), and Biological (plant roots, burrowing animals, and human mining/quarrying).

Erosion by rivers

Hydraulic action (water force), abrasion/corrasion (grinding by the load), attrition (sediments colliding and wearing each other), and corrosion (chemical action of water).

Youthful stage

High energy, intense vertical and headward erosion. Landforms: waterfalls, plunge pools, V-shaped valleys, gorges and canyons (enlarged gorges).

Mature stage

Gentler slope, vertical erosion gives way to lateral erosion; the river meanders. Landforms: U-shaped valleys, alluvial fans and cones, meanders (with bluffs, slip-off slopes and ox-bow lakes).

Old stage

Almost no slope; deposition dominates. Landforms: deltas (needs gentle slope, long course, little tidal action and plenty of sediment), distributaries and levees (natural embankments).

Delta and drainage types

Delta types: Arcuate (arc - Ganga-Brahmaputra, Nile), Bird's-foot (claw - Mississippi), Cuspate (tooth - Tiber). Drainage patterns: Dendritic (tree-like - Indus), Trellis (right angles - Appalachian), Radial (out from a dome - Amarkantak), Centripetal (into a basin), Annular (rings). By origin: Antecedent (older than the land - Himalayan rivers) and Consequent (younger - peninsular rivers).

Diagrams

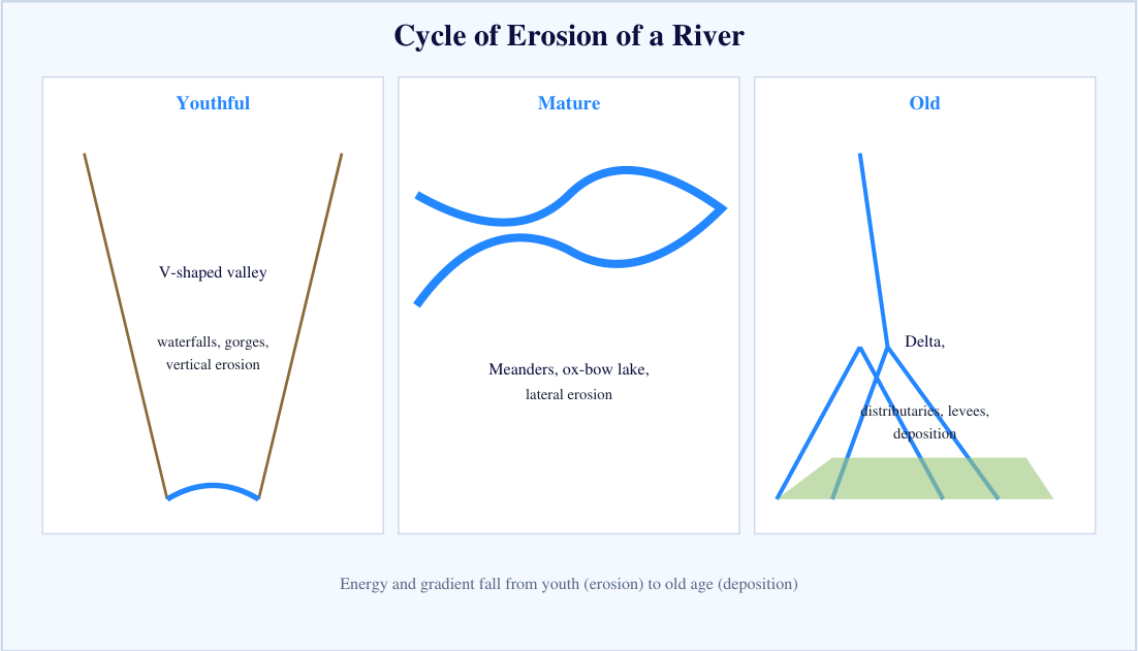

Fig: River Cycle of Erosion

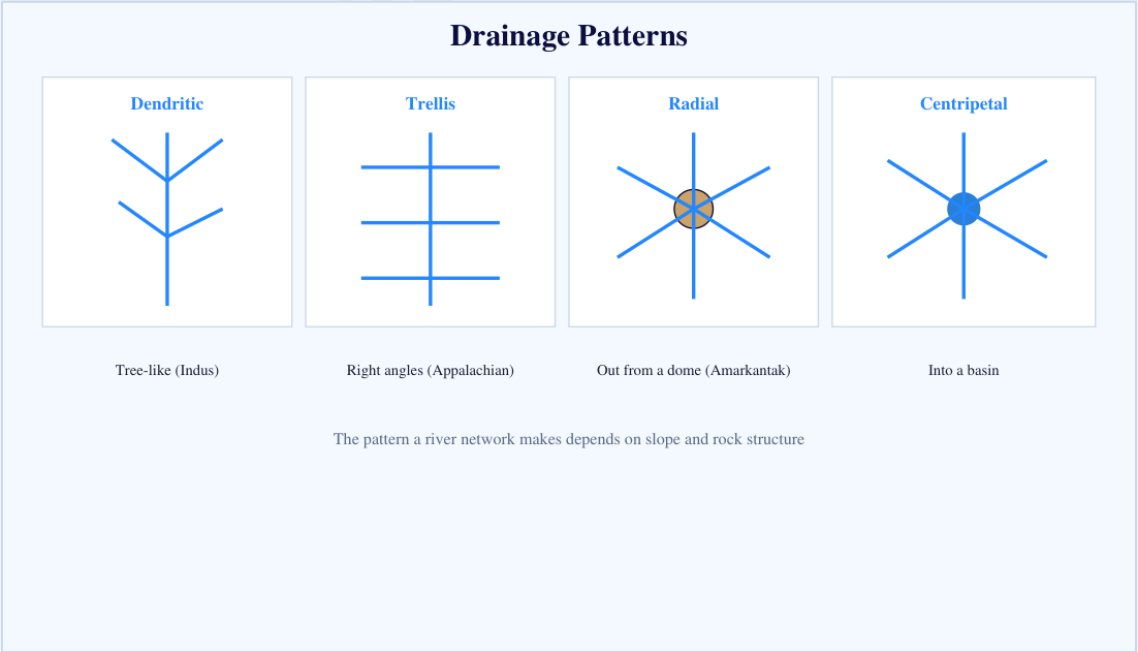

Fig: Drainage Patterns

River stages

Stage	Dominant process	Key landforms
Youthful	Vertical erosion	V-valley, waterfalls, gorges
Mature	Lateral erosion	Meanders, ox-bow lakes, U-valley
Old	Deposition	Delta, distributaries, levees

APSC Exam Tips

Score boosters

- Carbonation acts on limestone (caverns); oxidation rusts iron-rich rock.
- V-shaped valley = youth; meanders/ox-bow = maturity; delta = old age.
- Arcuate delta = Ganga-Brahmaputra & Nile; Bird's-foot = Mississippi.
- Antecedent rivers (Himalayan) are older than the mountains they cut through.

Quick Revision

Weathering, Erosion & Rivers - recap

- Weathering: physical, chemical (carbonation/oxidation), biological.
- River erosion: hydraulic, abrasion, attrition, corrosion.
- Youth (V-valley) -> Mature (meander) -> Old (delta).
- Drainage: dendritic, trellis, radial, centripetal, annular.

CHAPTER 7

Oceanography I: Currents & Ocean Floor

What it means

Ocean currents are rivers within the sea - large bodies of water moving in a set direction. They control climate, rainfall and fishing across the world. Below them, the ocean floor has its own mountains, plains and trenches.

In simple words

Currents act like giant conveyor belts carrying warm or cold water around the planet. A warm belt brings rain and mild weather to a coast; a cold belt brings dryness and even deserts. Where warm and cold belts meet, fish thrive.

Key concepts

What drives currents

The Earth's rotation, temperature differences (water flows from warm to cold), wind (drags the surface), salinity (water moves from low- to high-salinity), and coastlines (which deflect and split currents).

Warm vs cold and their effects

Warm currents bring rainfall and mild climate (Gulf Stream warms eastern USA and, as the North Atlantic Drift, keeps European ports ice-free). Cold currents bring dryness and deserts (Canary -> Sahara; Benguela -> Namib; Peru/Humboldt -> Atacama; California -> Mojave/Sonoran; West Australian -> Australian deserts).

Fishing grounds

Where a warm and a cold current meet, mixing brings nutrients and fish: Grand Bank (Gulf Stream meets Labrador, off Newfoundland), Dogger Bank (North Atlantic Drift meets Irminger), and off Japan (warm Kuroshio meets cold Oyashio).

Ocean floor topography

Continental shelf (gentle 1-5° slope, rich in fishing and minerals), continental slope (connecting link, no deposits), continental rise (transition to oceanic crust), and the abyssal plain - home to sea-mounts (from convergence), ridges (from divergence) and trenches (deep, volcanic rift valleys).

Diagrams

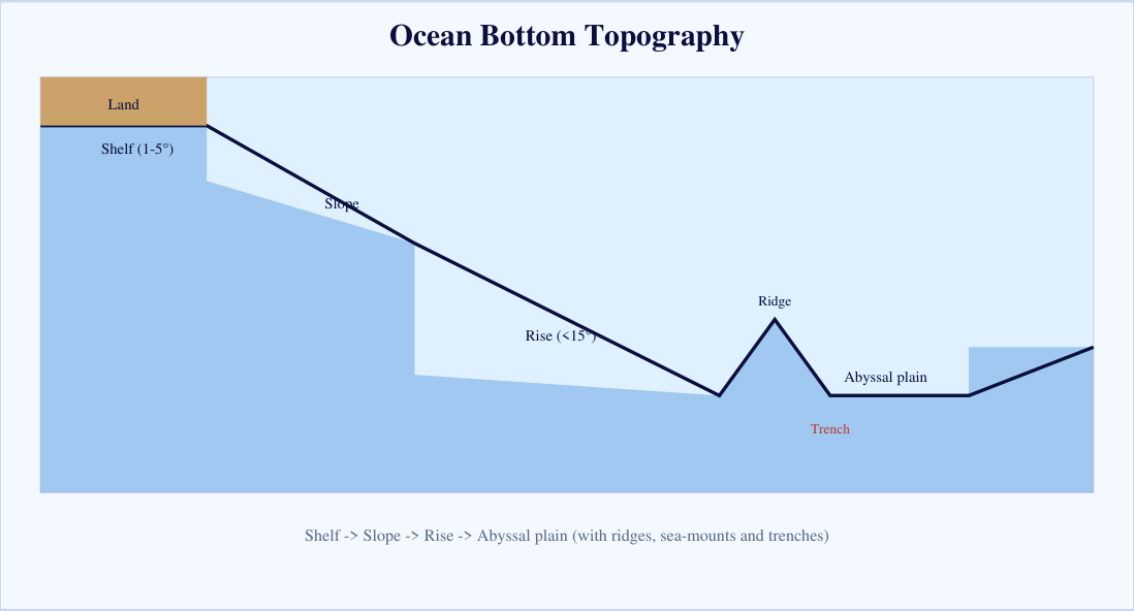

Fig: Ocean Bottom Topography

Cold currents and the deserts they help form

Cold current	Desert
Canary	Sahara
Benguela	Namib
Peru / Humboldt	Atacama (driest)
California	Mojave / Sonoran

APSC Exam Tips

Score boosters

- Warm currents = rain & mild climate; cold currents = dryness & deserts.
- Cold current -> desert pairs are a goldmine (Peru->Atacama, Benguela->Namib).
- Fishing grounds form where warm meets cold (Grand Bank, Dogger Bank).
- Ocean floor order: Shelf -> Slope -> Rise -> Abyssal plain.

Quick Revision

Oceanography I: Currents & Ocean Floor - recap

- Drivers: rotation, temperature, wind, salinity, coastline.
- Warm = rain; Cold = desert (Atacama from Peru current).
- Warm+cold meeting = fishing ground (Grand Bank, Dogger Bank).
- Floor: continental shelf, slope, rise, abyssal plain.

CHAPTER 8

Oceanography II: Temperature, Salinity, Tides & Corals

What it means

This chapter covers how warm and how salty the ocean is, how it rises and falls (tides and waves), the living coral reefs, and how international law divides the sea.

In simple words

The sea is warmest and saltiest near the equator and gets colder and fresher towards the poles. Twice a day the Moon's pull makes the water rise and fall (tides), and tiny coral animals quietly build the world's biggest living structures.

Key concepts

Ocean temperature

Depends on latitude (warmer near the equator), currents, evaporation, precipitation and salinity. Vertically there are three zones: the photic zone (to 200 m, sunlit, fairly constant), the thermocline (to 1000 m, sharp fall) and the deep zone (cold and stable).

Salinity

The salt dissolved in 1000 g of water (parts per thousand). It rises with evaporation and high pressure, and falls with rainfall and river inflow. Example: the Arabian Sea is saltier than the Bay of Bengal because most Indian rivers (about 73%) drain into the Bay, diluting it.

Tides

Rhythmic rise and fall from the pull of the Moon and Sun. Spring tides (highest) occur when Sun-Moon-Earth align (syzygy); neap tides (lowest) occur when they are at right angles (quadrature). By frequency: semi-diurnal (two highs, two lows a day), diurnal (one each) and mixed.

Waves & sea-level change

Waves are wind-driven surface oscillations. Sea level rises with global warming (thermal expansion + melting ice) and tectonics; it falls with cooling and uplift of land. Seafloor spreading (Harry Hess) is shown by matching magnetic stripes on either side of mid-ocean ridges.

Corals & reefs

Corals are polyps living in symbiosis with zooxanthellae; they need warm (20-25°C), saline (30-35 ppt), shallow, clean water and food. They secrete CaCO3 to build reefs: fringing (on the shore), barrier (a lagoon between reef and shore - Great Barrier Reef) and atoll (a ring on a mid-ocean ridge). Coral bleaching is their death from stress (e.g. warming).

UNCLOS maritime zones

Measured from the baseline: internal waters, the territorial sea (12 nautical miles, full sovereignty but innocent passage allowed), the contiguous zone (24 nm, for customs/immigration), the Exclusive Economic Zone (200 nm, resource rights only), and the high seas (the 'common heritage of mankind', beyond national control).

Diagrams

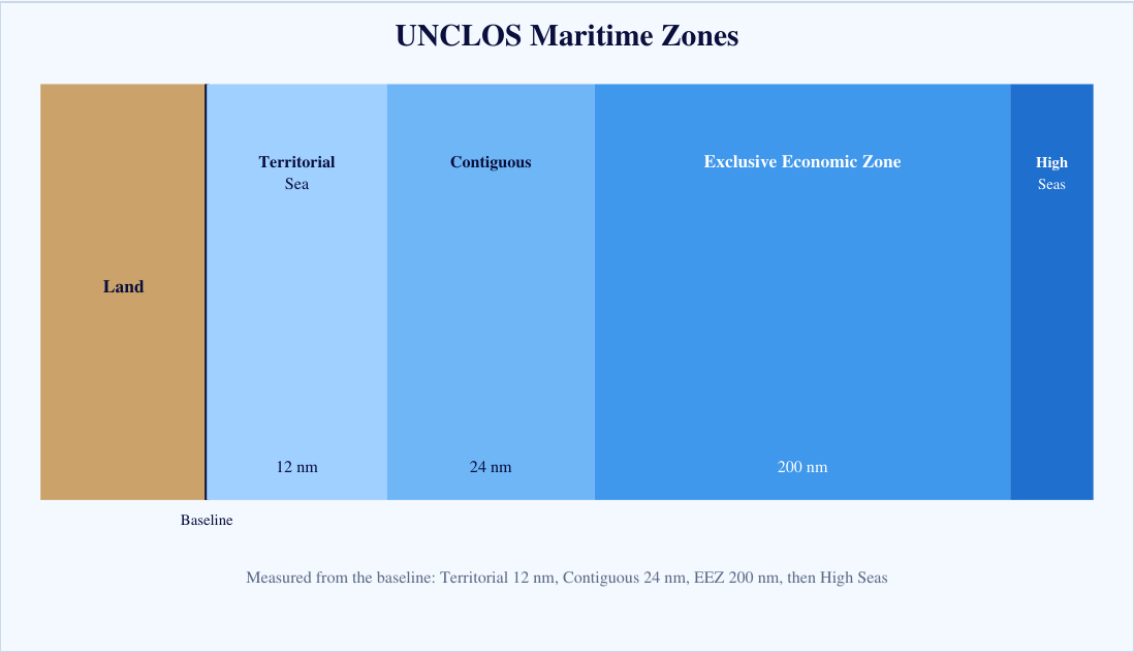

Fig: UNCLOS Maritime Zones

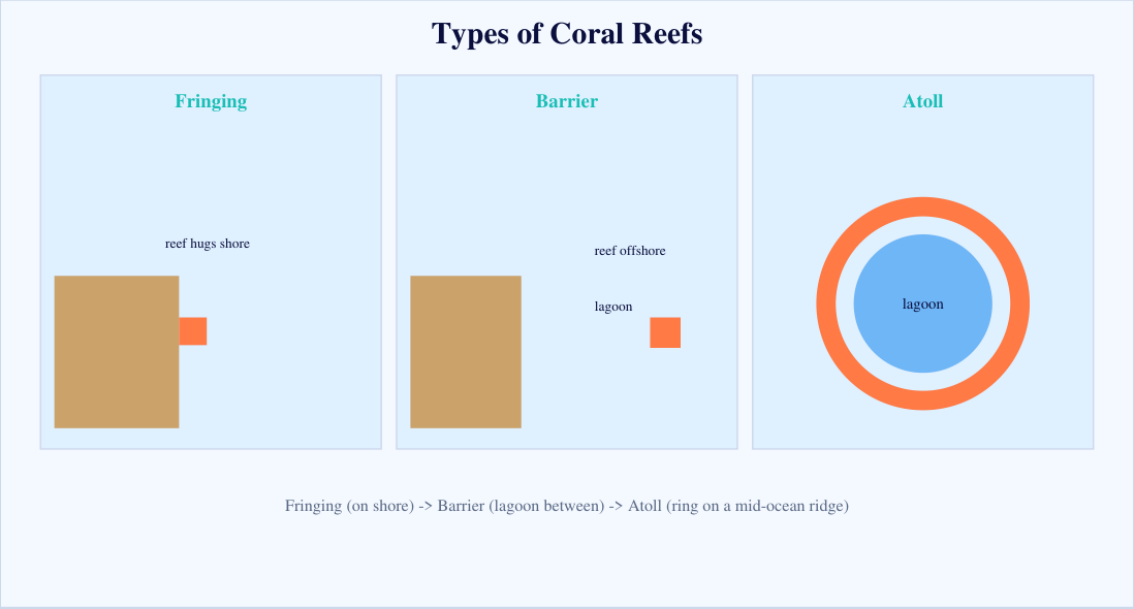

Fig: Types of Coral Reefs

UNCLOS zones from the baseline

Zone	Limit	Main right
Territorial Sea	12 nm	Full sovereignty (innocent passage)
Contiguous Zone	24 nm	Customs, immigration, sanitary
EEZ	200 nm	Resource rights only
High Seas	beyond EEZ	Common heritage of mankind

APSC Exam Tips

Score boosters

- Arabian Sea saltier than Bay of Bengal (more rivers dilute the Bay).
- Spring tide = alignment (syzygy); Neap tide = right angle (quadrature).
- Atoll = ring reef on a mid-ocean ridge; Barrier reef has a wide lagoon.
- UNCLOS numbers: 12 / 24 / 200 nm - territorial / contiguous / EEZ.

Quick Revision

Oceanography II: Temperature, Salinity, Tides & Corals - recap

- Temp zones: photic (200 m), thermocline (1000 m), deep.
- Salinity up with evaporation, down with rain/rivers.
- Spring tide (syzygy) high; neap tide (quadrature) low.
- Reefs: fringing, barrier (lagoon), atoll (ring); 12/24/200 nm UNCLOS.

CHAPTER 9

Climatology I: Seasons & the Atmosphere

What it means

Seasons happen because the Earth is tilted as it orbits the Sun, and the atmosphere above us is built in layers, each with its own job - from holding our weather to burning up meteors.

In simple words

The Earth leans over like a spinning top tilted on its side. As it circles the Sun, sometimes the top half leans towards the Sun (our summer) and sometimes away (our winter). Above us the air is stacked in floors, like a building, each cooler or warmer than the last.

Key concepts

Why we have seasons

Two reasons: the Earth's revolution around the Sun and its fixed axial tilt (about 23.5°). The tilt means different parts get direct (vertical) sun rays at different times of year.

Solstices

21 June - vertical rays on the Tropic of Cancer; the Northern Hemisphere has its longest day (summer solstice). 22 December - vertical rays on the Tropic of Capricorn; the Southern Hemisphere has summer (winter solstice in the north).

Equinoxes

21 March and 23 September - the Sun is vertical over the equator and day and night are equal everywhere. (21 March = spring equinox in the north; 23 September = autumn equinox in the north.)

Atmospheric layers

Troposphere (0-18 km, all weather, temperature falls ~1°C per 165 m - the normal lapse rate); Stratosphere (to 50 km, dry, holds the ozone layer that blocks UV, smooth for flights); Mesosphere (to 80 km, coldest, meteors burn up); Thermosphere/Ionosphere (80-400 km, charged ions reflect radio waves); Exosphere (outermost, to ~10,000 km).

Diagrams

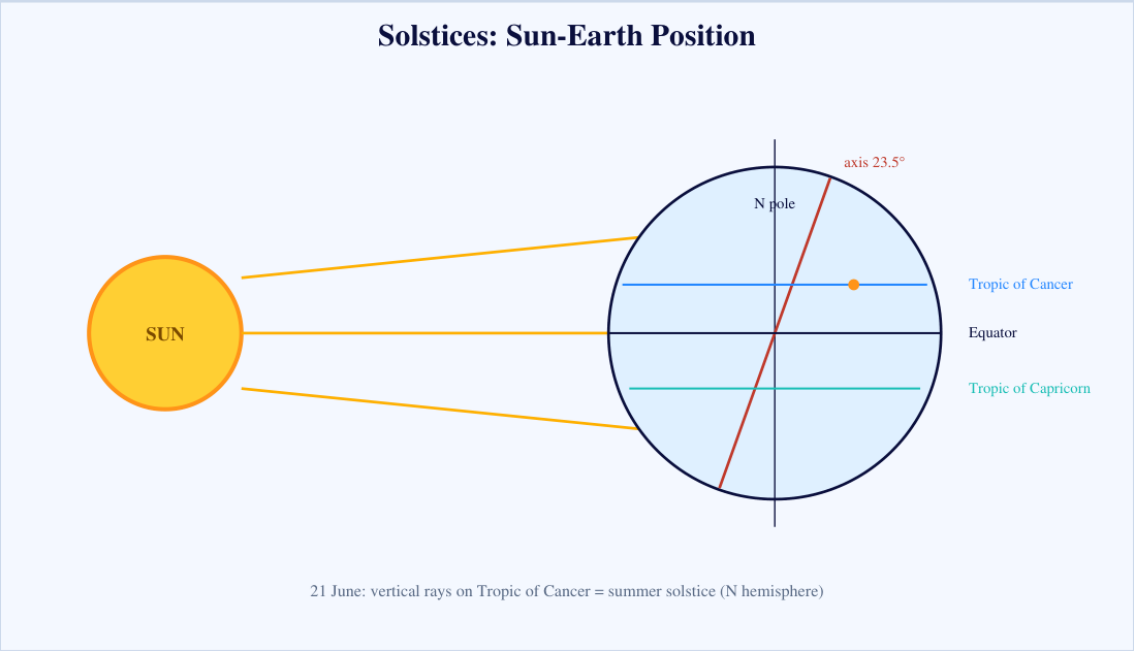

Fig: Solstices: Sun-Earth Position

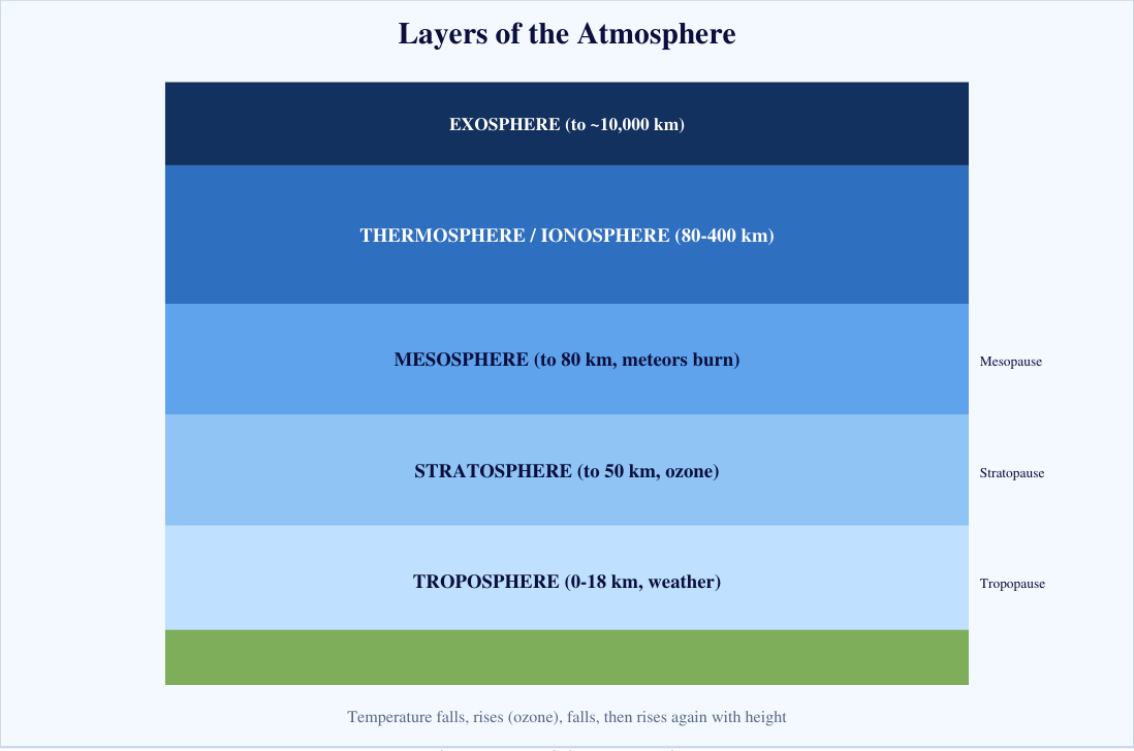

Fig: Layers of the Atmosphere

Key dates

Date	Sun overhead	Event
21 June	Tropic of Cancer	Summer solstice (N)
22 December	Tropic of Capricorn	Winter solstice (N)
21 Mar / 23 Sep	Equator	Equinox (equal day & night)

APSC Exam Tips

Score boosters

- Seasons need BOTH revolution and axial tilt - tilt alone is not enough.
- 21 June = Cancer (N summer); 22 Dec = Capricorn (S summer).
- Ozone is in the STRATOSPHERE; meteors burn in the MESOSPHERE.
- Ionosphere reflects radio waves (long-distance broadcasting).

Quick Revision

Climatology I: Seasons & the Atmosphere - recap

- Seasons = revolution + axial tilt (23.5°).
- 21 Jun Cancer, 22 Dec Capricorn, equinoxes on equator.
- Layers: Troposphere, Stratosphere (ozone), Mesosphere (meteors), Thermosphere (radio), Exosphere.
- Normal lapse rate ~1°C per 165 m.

CHAPTER 10

Climatology II: Temperature & Pressure Belts

What it means

Temperature and air pressure are never the same everywhere - they change with height and latitude. These differences create the world's great pressure belts and the winds that blow between them.

In simple words

Warm air is light and rises (making low pressure below); cool air is heavy and sinks (making high pressure). This simple see-saw, repeated around the globe, sets up bands of high and low pressure - and air always rushes from high to low, which is wind.

Key concepts

Factors affecting temperature

Altitude (cooler with height), latitude (cooler towards the poles), continentality (interiors are more extreme than coasts), nature of the surface (sand heats fast, so deserts are hot), wind, and ocean currents.

Temperature inversion

Normally temperature falls with height; inversion is when it rises with height. Types: upper-air, radiation (long winter nights), advection (over ice), frontal (warm air lifted over cold), and valley inversion (cold katabatic air sinking into valleys).

Factors affecting pressure

Temperature (warm air -> low pressure; so the equator has lower pressure than the poles), altitude (pressure falls with height), ocean currents, and the Earth's rotation (centrifugal effect).

Seven pressure belts

Equatorial Low (0°, thermal, hot air rises), Sub-tropical High (30°N & 30°S, dynamic/thermal, sinking air), Sub-polar Low (60°N & 60°S, dynamic), and Polar High (90°N & 90°S, thermal, cold dense air). The belts shift north and south as the Sun's vertical rays move.

Diagrams

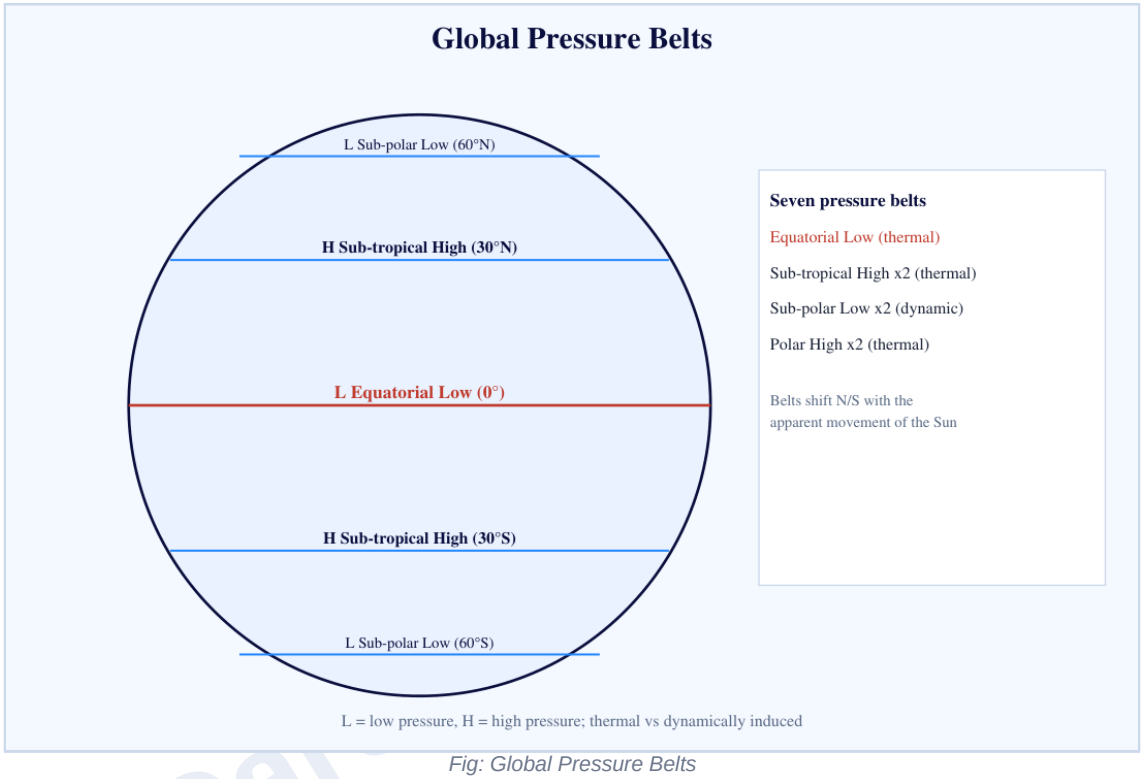

Fig: Global Pressure Belts

The seven pressure belts

Belt	Latitude	Type
Equatorial Low	0°	Thermal
Sub-tropical High	30° N & S	Dynamic/thermal
Sub-polar Low	60° N & S	Dynamic
Polar High	90° N & S	Thermal

APSC Exam Tips

Score boosters

- Inversion = temperature RISES with height (the opposite of normal).
- Equator = low pressure (hot, rising air); Poles = high pressure (cold, sinking).
- Sub-tropical High & Sub-polar Low are partly 'dynamic' (rotation-driven).
- Pressure belts shift N/S with the Sun - they are not fixed.

Quick Revision

Climatology II: Temperature & Pressure Belts - recap

- Temp factors: altitude, latitude, continentality, surface, wind, currents.
- Inversion = temperature rises with height (radiation, valley, etc.).
- Warm air = low pressure; cold air = high pressure.
- Belts: Equatorial Low, Sub-tropical High, Sub-polar Low, Polar High.

CHAPTER 11

World Regional Geography (Map Facts)

What it means

APSC loves map-based questions. This chapter gathers the must-know features of North America, South America and Australia/New Zealand - their mountains, rivers, deserts, plateaus and economic specialities.

In simple words

Think of this as your atlas cheat-sheet: the highest peak here, the driest desert there, the country that leads the world in copper or iron ore. Picture each fact on the map and it will stick.

Key concepts

Mountains & peaks

The Andes is the world's longest mountain range (Aconcagua is its - and South America's - highest peak). The Rockies (young fold) and Appalachians (old fold, coal) are in North America. Australia's old fold mountains are the Great Dividing Range (highest: Kosciuszko); New Zealand has the Southern Alps (highest: Mount Cook).

Deserts & grasslands

Atacama (Chile) is the world's driest desert (cold Peru current); Patagonia (Argentina) is a rain-shadow desert. Grasslands: Pampas (temperate, S. America), Llanos and Campos (tropical), Prairies (N. America), Darling Downs (Australia).

Rivers, lakes & falls

Mississippi is North America's largest river; Murray-Darling is Australia's largest. Lake Superior is the world's largest freshwater lake; Lake Titicaca is the highest navigable lake; Lake Eyre is Australia's largest and lowest point. Angel Falls (Orinoco, Venezuela) is the world's highest waterfall.

Economic specialities

Australia is the world's largest iron-ore producer; Brazil leads in sugarcane (2nd in iron ore); Chile leads in copper. City nicknames: Detroit (automobiles), Pittsburgh (steel), San Francisco (Silicon Valley), Akron (rubber/tyres), Sao Paulo (coffee city).

Highest peaks & ranges

Feature	Note
Andes	World's longest range (2nd after Himalaya in height)
Aconcagua	Highest peak of S. America & the Andes
Rockies / Appalachians	Young / old fold mountains of N. America
Great Dividing Range	Old fold mountains of Australia (Kosciuszko highest)
Southern Alps	New Zealand (Mount Cook highest)

Records & specialities

Record	Place
Driest desert	Atacama (Chile, cold Peru current)
Highest waterfall	Angel Falls (Orinoco, Venezuela)
Largest freshwater lake	Lake Superior
Highest navigable lake	Lake Titicaca
Largest iron-ore producer	Australia
Leading copper producer	Chile

APSC Exam Tips

Score boosters

- Andes = longest range; Aconcagua = highest peak of S. America.
- Atacama (driest) links to the cold Peru/Humboldt current - a cross-topic favourite.
- Australia = top iron ore; Chile = top copper; Brazil = top sugarcane.
- City nicknames (Detroit, Pittsburgh, Silicon Valley) are easy map-fact marks.

Quick Revision

World Regional Geography (Map Facts) - recap

- Andes longest; Aconcagua highest (S. America).
- Atacama driest (Peru current); Patagonia rain-shadow.
- Superior largest freshwater; Titicaca highest navigable; Eyre lowest in Australia.
- Australia iron ore, Chile copper, Brazil sugarcane.

REFERENCE

Important Definitions

Crisp, exam-ready definitions of the core geography terms in this volume.

Asthenosphere	The semi-molten upper part of the mantle on which plates float.
Seismic waves	Energy waves from an earthquake - surface (L, R) and body (P, S) waves.
Shadow zone	A belt where certain seismic waves are not recorded (P: 103-143°, S: beyond 103°).
Plate	The crust plus the solid upper mantle, which moves over the asthenosphere.
Pangaea	The single ancient supercontinent that split into Laurasia and Gondwana.
Focus / Epicentre	Point of origin of an earthquake (underground) / the point directly above it.
Magma / Lava	Molten rock inside the Earth / the same after it reaches the surface.
Caldera	A volcanic crater enlarged by collapse, bigger than an ordinary crater.
Weathering	Breakdown of rock in place by physical, chemical or biological action.
Erosion	Wearing away and transport of rock material by rivers, wind or ice.
Meander	A looping, zig-zag bend of a river in its mature stage.
Delta	A depositional landform at a river's mouth (arcuate, bird's-foot or cuspate).
Ocean current	A large mass of ocean water moving in a fixed direction.
Salinity	Salt dissolved in 1000 g of sea water, in parts per thousand.
Thermocline	The ocean layer (to ~1000 m) where temperature falls sharply with depth.
Spring / Neap tide	Highest tide (Sun-Moon-Earth aligned) / lowest tide (at right angles).
Coral reef	A $CaCO_3$ structure built by coral polyps (fringing, barrier or atoll).
EEZ	Exclusive Economic Zone - 200 nm with resource rights for the coastal state.
Lapse rate	The fall of temperature with height (normal: ~1°C per 165 m).
Temperature inversion	An abnormal situation where temperature rises with height.
Pressure belt	A global band of high or low air pressure (e.g. Equatorial Low).
Isotherm	A line joining places of equal temperature on a map.

GLOSSARY

Important Terms

A quick glossary of geography terms an APSC aspirant must know.

SIAL / SIMA / NIFE	Crust (Si+Al) / Mantle (Si+Mg) / Core (Ni+Fe).
Love & Rayleigh waves	Surface seismic waves; Rayleigh causes most surface damage.
Panthalassa / Tethys	The mega-ocean around Pangaea / the sea between Laurasia and Gondwana.
Ring of Fire	The Pacific belt with the most earthquakes and volcanoes.
Richter / Mercalli	Scales of earthquake magnitude (0-9) / intensity (1-12).
Pyroclastic material	Solid fragments thrown out by a volcano (lapilli, scoria, pumice).
Batholith / Laccolith	Large intrusive magma body / dome-shaped intrusive landform.
Graben / Horst	A down-faulted rift valley / an up-faulted block mountain.
Ox-bow lake	A cut-off meander loop shaped like a horseshoe.
Gulf Stream	Warm current that moderates eastern USA and (as N. Atlantic Drift) Europe.
Grand Bank / Dogger Bank	Rich fishing grounds where warm and cold currents meet.
Zooxanthellae	Algae living in symbiosis with corals, giving them colour and food.
Innocent passage	Right to sail through territorial waters without harming the coastal state.
Syzygy / Quadrature	Sun-Moon-Earth in a line (spring tide) / at right angles (neap tide).
Katabatic / Anabatic wind	Cold air sinking down a slope / warm air rising up a slope.
Seafloor spreading	Harry Hess's idea: new crust forms and spreads from mid-ocean ridges.

CONCEPTS

Frequently Asked Concepts

Twenty conceptual doubts APSC aspirants often raise, answered simply.

Q1. How do we know the Earth's outer core is liquid?
A. S-waves (which travel only through solids) disappear beyond 103° from the focus - the S-wave shadow zone. Their absence shows the outer core must be liquid.

Q2. What is the difference between the focus and the epicentre?
A. The focus (hypocentre) is the underground point where an earthquake starts; the epicentre is the point on the surface directly above it.

Q3. Why do the continents seem to fit together?
A. Because they were once joined as Pangaea and have since drifted apart - shown by jigsaw fit, matching fossils and matching rocks.

Q4. Why is convergence called 'destructive'?
A. At convergent boundaries plates collide and crust is consumed (subducted) or crumpled, reducing the Earth's surface area - hence destructive.

Q5. Why is the Pacific Ring of Fire so active?
A. It lies along convergent boundaries where oceanic and continental plates meet, causing frequent earthquakes and volcanoes.

Q6. What is the difference between magnitude and intensity?
A. Magnitude (Richter, 0-9) measures the energy released; intensity (Mercalli, 1-12) measures how strongly the shaking is felt.

Q7. Why is acidic lava more dangerous than basic lava?
A. Acidic lava has high silica and high viscosity, so it traps gas and erupts explosively, building steep cones; basic lava flows gently.

Q8. Which rocks contain fossils, and why?
A. Sedimentary rocks, because they form in layers from sediments that can bury and preserve plant and animal remains.

Q9. How does a river change as it ages?
A. It shifts from vertical erosion (youth: V-valleys, waterfalls) to lateral erosion (maturity: meanders) to deposition (old age: deltas).

Q10. Why do cold currents create deserts?
A. Cold currents cool the air above them, reducing its moisture and causing dryness on the nearby coast (e.g. Peru current -> Atacama).

Q11. Why do fishing grounds form where currents meet?
A. The mixing of warm and cold water brings up nutrients and encourages plankton, the base of the food chain - as at the Grand Bank.

Q12. Why is the Arabian Sea saltier than the Bay of Bengal?
A. Far more Indian river water (about 73%) drains into the Bay of Bengal, diluting it, while less freshwater reaches the Arabian Sea.

Q13. When do spring and neap tides occur?
A. Spring (highest) tides occur when the Sun, Moon and Earth are aligned (syzygy); neap (lowest) tides when they are at right angles (quadrature).

Q14. How does a coral atoll form?

A. Corals build a ring-shaped reef on a mid-ocean ridge, enclosing a central lagoon - unlike fringing reefs that hug the shore.

Q15. What rights does a country have in its EEZ?

A. Only resource rights - exploring and using natural resources up to 200 nm; it cannot block freedom of navigation or overflight.

Q16. Why do we have seasons?

A. Because the Earth both revolves around the Sun and is tilted on its axis (~23.5°), so different latitudes get direct sun at different times.

Q17. Where is the ozone layer, and why does it matter?

A. In the stratosphere; it absorbs harmful ultraviolet radiation and protects life on Earth.

Q18. What is a temperature inversion?

A. An abnormal condition where temperature rises (instead of falling) with height - common on long, clear winter nights and in valleys.

Q19. Why is air pressure low at the equator?

A. Intense heating makes the air warm, light and rising, creating the Equatorial Low Pressure Belt.

Q20. Why is Atacama the world's driest desert?

A. The cold Peru (Humboldt) current chills the coastal air, preventing rainfall and producing extreme dryness.

SUMMARY

Exam-Oriented Summary

Every must-remember fact of this volume, distilled into one place.

- Interior: P-waves (solid+liquid), S-waves (solid only); shadow zones prove a liquid outer core.
- Layers: SIAL crust, SIMA mantle, NIFE core; outer core molten, inner core solid.
- Wegener (1912): Pangaea -> Laurasia + Gondwana (Tethys Sea between).
- Convergent boundary = destructive (fold mountains, trenches, volcanoes); Divergent = ridges.
- Himalaya = continental-continental convergence; Pacific Ring of Fire = most active belt.
- Earthquake: focus underground, epicentre above; Richter (magnitude) vs Mercalli (intensity).
- Volcanism: acidic lava = steep/explosive; basic = gentle/fluid; Barren Island = India's active volcano.
- Sedimentary rocks have fossils; folds (SAMIR) and faults (normal=rift valley) build relief.
- River stages: youth (V-valley) -> mature (meander) -> old (delta).
- Cold currents -> deserts (Peru->Atacama, Benguela->Namib); warm+cold meet -> fishing grounds.
- UNCLOS: territorial 12 nm, contiguous 24 nm, EEZ 200 nm, then high seas.
- Atmosphere: troposphere (weather), stratosphere (ozone), mesosphere (meteors), ionosphere (radio).
- Seasons = revolution + 23.5° tilt; 21 Jun Cancer, 22 Dec Capricorn, equinoxes on the equator.
- Pressure belts: Equatorial Low, Sub-tropical High, Sub-polar Low, Polar High - they shift with the Sun.

LAST-MINUTE

Final Revision Section

One-line triggers for the last 30 minutes before the exam.

Rapid-fire recall

- P-waves solid+liquid; S-waves solid only.
- P-shadow 103-143°; S-shadow beyond 103°.
- SIAL-SIMA-NIFE = crust-mantle-core.
- Pangaea -> Laurasia (N) + Gondwana (S), Tethys between.
- 7 major plates; convergent destructive, divergent constructive.
- Himalaya = continental-continental collision.
- Focus underground; epicentre on surface.
- Richter 0-9 magnitude; Mercalli 1-12 intensity.
- Barren Island active, Narcondam extinct.
- Acidic lava steep/explosive; basic gentle/fluid.
- Sedimentary rocks hold fossils.
- Youth V-valley, mature meander, old delta.
- Atacama driest (cold Peru current).
- UNCLOS: 12 / 24 / 200 nm.
- Ozone in stratosphere; meteors burn in mesosphere.
- 21 Jun Cancer, 22 Dec Capricorn; equinoxes on equator.
- Inversion = temperature rises with height.
- Andes longest range; Aconcagua highest in S. America; Atacama driest desert.

PRELIMS PRACTICE

APSC-Style MCQs (with answers)

35 statement-based, assertion-reason and map-based MCQs - the modern APSC pattern. Each has four options, the correct answer, a full explanation and a difficulty rating.

Q1. Consider the following direct sources of information about the Earth's interior: MEDIUM

1. Volcanic eruptions
2. Seismic waves
3. Deep drilling

Which are DIRECT sources?

(A) 1 and 2 only
(B) 1 and 3 only
(C) 2 and 3 only
(D) 1, 2 and 3

Answer: (B) 1 and 3 only

Explanation: Volcanic eruptions and drilling are direct sources. Seismic waves are an INDIRECT source.

Q2. Assertion (A): The Earth's outer core is in a liquid state. HARD
Reason (R): S-waves are not recorded beyond 103° from the focus.

(A) Both A and R true and R explains A
(B) Both true but R does not explain A
(C) A true, R false
(D) A false, R true

Answer: (A) Both A and R true and R explains A

Explanation: Both are true and R explains A - S-waves travel only through solids, so their disappearance shows the outer core is liquid.

Q3. With reference to seismic waves, consider: MEDIUM

1. P-waves travel through both solids and liquids.
2. S-waves travel through solids only.
3. Rayleigh waves cause the maximum surface destruction.

Which are correct?

(A) 1 and 2 only
(B) 2 and 3 only
(C) 1 and 3 only
(D) 1, 2 and 3

Answer: (D) 1, 2 and 3

Explanation: All three are correct statements about body and surface waves.

Q4. The layers SIAL, SIMA and NIFE refer respectively to the: EASY

(A) Core, mantle and crust
(B) Crust, mantle and core
(C) Mantle, crust and core
(D) Crust, core and mantle

Answer: (B) Crust, mantle and core

Explanation: SIAL = crust (Si+Al), SIMA = mantle (Si+Mg), NIFE = core (Ni+Fe).

Q5. The P-wave shadow zone lies between which angular distances from the focus? MEDIUM

(A) 0° and 103°
(B) 103° and 143°
(C) 143° and 180°
(D) Beyond 103° all around

Answer: (B) 103° and 143°

Explanation: No P-waves are recorded between 103° and 143° - the P-wave shadow zone.

Q6. According to Wegener's Continental Drift theory, Pangaea first split into: EASY

(A) North America and Eurasia
(B) Laurasia and Gondwana
(C) Gondwana and Tethys
(D) Panthalassa and Tethys

Answer: (B) Laurasia and Gondwana

Explanation: Pangaea split into Laurasia (north) and Gondwana (south), with the Tethys Sea between them.

Q7. Which of the following is NOT cited as evidence for Continental Drift? MEDIUM

(A) Jigsaw fit of continents
(B) Matching Glossopteris fossils
(C) Matching placer deposits
(D) Identical ocean currents

Answer: (D) Identical ocean currents

Explanation: Wegener's evidence was the jigsaw fit, matching fossils and matching rocks/placer deposits - not ocean currents.

Q8. The Himalayas were formed by which type of plate convergence? MEDIUM

(A) Continental-oceanic
(B) Oceanic-oceanic
(C) Continental-continental
(D) Divergent

Answer: (C) Continental-continental

Explanation: The Indian plate collided with the Eurasian plate (continental-continental convergence), buckling sediments into the Himalaya.

Q9. Assertion (A): Convergent plate boundaries are called destructive boundaries.
Reason (R): At convergence, crust is consumed or crumpled, reducing the Earth's surface area. HARD

(A) Both A and R true and R explains A
(B) Both true but R does not explain A
(C) A true, R false
(D) A false, R true

Answer: (A) Both A and R true and R explains A

Explanation: Both are true and R correctly explains why convergent boundaries are 'destructive'.

Q10. Match the scale with what it measures: EASY

1. Richter scale 2. Mercalli scale

(A) 1-intensity, 2-magnitude
(B) 1-magnitude, 2-intensity
(C) Both measure magnitude
(D) Both measure intensity

Answer: (B) 1-magnitude, 2-intensity

Explanation: Richter measures magnitude (energy, 0-9); Mercalli measures intensity (felt effect, 1-12).

Q11. Which of the following is India's only ACTIVE volcano? MEDIUM

(A) Narcondam Island
(B) Barren Island
(C) Deccan Traps
(D) Mount Abu

Answer: (B) Barren Island

Explanation: Barren Island (east of the Andamans) is India's only active volcano; Narcondam is extinct.

Q12. With reference to lava types, consider: MEDIUM

1. Acidic lava has high silica and is highly explosive.
2. Basic lava has high fluidity and forms gentle slopes.

Which is/are correct?

(A) 1 only
(B) 2 only
(C) Both 1 and 2
(D) Neither

Answer: (C) Both 1 and 2

Explanation: Both are correct - acidic lava is viscous and explosive; basic lava is fluid and forms gentle slopes.

Q13. Which intrusive volcanic landform is dome or mushroom shaped? HARD

(A) Sill
(B) Dyke
(C) Laccolith
(D) Lopolith

Answer: (C) Laccolith

Explanation: A laccolith is a domed/mushroom-shaped intrusive landform; a lopolith is saucer-shaped, a dyke vertical and a sill horizontal.

Q14. Which rock type is stratified and characteristically contains fossils? EASY

(A) Igneous
(B) Sedimentary
(C) Metamorphic
(D) Plutonic

Answer: (B) Sedimentary

Explanation: Sedimentary rocks form in layers and can preserve fossils of plants and animals.

Q15. Match the metamorphism correctly: MEDIUM

1. Limestone 2. Coal 3. Clay

(A) 1-Marble, 2-Graphite, 3-Slate
(B) 1-Slate, 2-Marble, 3-Graphite
(C) 1-Graphite, 2-Slate, 3-Marble
(D) 1-Marble, 2-Slate, 3-Graphite

Answer: (A) 1-Marble, 2-Graphite, 3-Slate

Explanation: Limestone -> Marble, Coal -> Graphite, Clay -> Slate.

Q16. A normal fault is produced by which force, and forms which landform? HARD

(A) Compression; block mountain only
(B) Tension; a rift valley (graben)
(C) Tension; fold mountain
(D) Compression; ox-bow lake

Answer: (B) Tension; a rift valley (graben)

Explanation: A normal fault results from tensional force; the sunken block forms a rift valley (graben), e.g. the East African Rift.

Q17. Carbonation, a type of chemical weathering, acts mainly on: MEDIUM

(A) Granite
(B) Limestone
(C) Basalt
(D) Quartzite

Answer: (B) Limestone

Explanation: Carbonation (CO2 + water = carbonic acid) dissolves limestone, forming caverns and sinkholes.

Q18. Which landform is characteristic of a river's YOUTHFUL stage? EASY

(A) Delta
(B) Ox-bow lake
(C) V-shaped valley
(D) Levee

Answer: (C) V-shaped valley

Explanation: Intense vertical erosion in the youthful stage carves V-shaped valleys, waterfalls and gorges.

Q19. The Mississippi delta is an example of which delta type? MEDIUM

(A) Arcuate
(B) Bird's-foot
(C) Cuspate
(D) Estuarine

Answer: (B) Bird's-foot

Explanation: The Mississippi forms a bird's-foot (claw-shaped) delta; arcuate examples include the Ganga-Brahmaputra and Nile.

Q20. With reference to drainage patterns, consider: MEDIUM

1. Dendritic - tree-like (Indus).
2. Trellis - tributaries at right angles (Appalachian).
3. Radial - rivers flow out from a dome.

Which are correctly matched?

(A) 1 and 2 only
(B) 2 and 3 only
(C) 1 and 3 only
(D) 1, 2 and 3

Answer: (D) 1, 2 and 3

Explanation: All three pairs are correctly matched.

Q21. Antecedent rivers are best described as those which: HARD

(A) Formed after the landforms
(B) Formed before the landforms (e.g. Himalayan rivers)
(C) Flow into a basin
(D) Never reach the sea

Answer: (B) Formed before the landforms (e.g. Himalayan rivers)

Explanation: Antecedent rivers existed before the land was uplifted (e.g. Himalayan rivers); consequent rivers formed afterwards.

Q22. Which factor does NOT directly drive ocean currents? EASY

(A) Earth's rotation
(B) Wind
(C) Salinity differences
(D) Soil type of the coast

Answer: (D) Soil type of the coast

Explanation: Currents are driven by rotation, temperature, wind, salinity and coastlines - not by coastal soil type.

Q23. Assertion (A): The Atacama is the world's driest desert.
Reason (R): The cold Peru (Humboldt) current chills coastal air and prevents rainfall.

MEDIUM

(A) Both A and R true and R explains A
(B) Both true but R does not explain A
(C) A true, R false
(D) A false, R true

Answer: (A) Both A and R true and R explains A

Explanation: Both are true and R explains A - the cold current causes the extreme dryness of the Atacama.

Q24. The Grand Bank, a rich fishing ground, forms where the Gulf Stream meets which cold current?

HARD

(A) Canary Current
(B) Labrador Current
(C) Benguela Current
(D) Kuroshio Current

Answer: (B) Labrador Current

Explanation: Off Newfoundland the warm Gulf Stream meets the cold Labrador Current, creating the Grand Bank fishing ground.

Q25. Arrange the ocean floor from the coast outward:
A. Abyssal plain B. Continental shelf C. Continental rise D. Continental slope

MEDIUM

(A) B-D-C-A
(B) B-C-D-A
(C) D-B-C-A
(D) B-D-A-C

Answer: (A) B-D-C-A

Explanation: From the coast: continental shelf -> slope -> rise -> abyssal plain (B-D-C-A).

Q26. Why is the Arabian Sea more saline than the Bay of Bengal?

MEDIUM

(A) The Arabian Sea is colder
(B) More Indian rivers (about 73%) drain into the Bay of Bengal, diluting it
(C) The Bay of Bengal has more evaporation
(D) The Arabian Sea receives more rainfall

Answer: (B) More Indian rivers (about 73%) drain into the Bay of Bengal, diluting it

Explanation: Most Indian river water drains into the Bay of Bengal, lowering its salinity; less freshwater dilutes the Arabian Sea.

Q27. A spring tide occurs when the Sun, Moon and Earth are:

EASY

(A) At right angles (quadrature)
(B) In a straight line (syzygy)
(C) Closest together
(D) Farthest apart

Answer: (B) In a straight line (syzygy)

Explanation: Spring (highest) tides occur at syzygy - when the three bodies are aligned; neap tides occur at quadrature.

Q28. Which coral reef type is a ring shape enclosing a lagoon, formed on a mid-oceanic ridge?

MEDIUM

(A) Fringing reef
(B) Barrier reef
(C) Atoll
(D) Patch reef

Answer: (C) Atoll

Explanation: An atoll is a circular/elliptical reef on a mid-ocean ridge enclosing a central lagoon.

Q29. Under UNCLOS, the Exclusive Economic Zone extends up to how far from the baseline, and gives what rights? MEDIUM

(A) 12 nm; full sovereignty
(B) 24 nm; customs control
(C) 200 nm; resource rights only
(D) 200 nm; full sovereignty

Answer: (C) 200 nm; resource rights only

Explanation: The EEZ extends to 200 nm and grants only resource rights - not the right to block navigation or overflight.

Q30. Consider the atmospheric layers: MEDIUM

1. The ozone layer lies in the stratosphere.
2. Meteors burn up in the mesosphere.
3. Radio waves are reflected by the ionosphere.

Which are correct?

(A) 1 and 2 only
(B) 2 and 3 only
(C) 1 and 3 only
(D) 1, 2 and 3

Answer: (D) 1, 2 and 3

Explanation: All three are correct features of the stratosphere, mesosphere and thermosphere/ionosphere.

Q31. On 21 June, the Sun's rays are vertical over the: EASY

(A) Equator
(B) Tropic of Cancer
(C) Tropic of Capricorn
(D) Arctic Circle

Answer: (B) Tropic of Cancer

Explanation: On 21 June the Sun is overhead at the Tropic of Cancer - the summer solstice in the Northern Hemisphere.

Q32. Assertion (A): Seasons occur on the Earth.
Reason (R): The Earth revolves around the Sun and is tilted on its axis by about 23.5°. MEDIUM

(A) Both A and R true and R explains A
(B) Both true but R does not explain A
(C) A true, R false
(D) A false, R true

Answer: (A) Both A and R true and R explains A

Explanation: Both are true and R explains A - seasons need both revolution and the axial tilt.

Q33. A temperature inversion is best defined as a situation where: MEDIUM

(A) Temperature falls with height
(B) Temperature rises with height
(C) Pressure rises with height
(D) Humidity falls with height

Answer: (B) Temperature rises with height

Explanation: Inversion is the abnormal condition in which temperature increases (rather than decreases) with height.

Q34. Which pressure belt is thermally induced by intense heating and rising air? MEDIUM

(A) Sub-tropical High
(B) Sub-polar Low
(C) Equatorial Low
(D) Polar High at 60°

Answer: (C) Equatorial Low

Explanation: The Equatorial Low Pressure Belt is thermally induced - hot air rises, creating low pressure near the surface.

Q35. Which of the following is correctly matched (world map facts)? HARD

(A) Andes - shortest range
(B) Aconcagua - highest peak of Africa
(C) Atacama - wettest desert
(D) Lake Titicaca - highest navigable lake

Answer: (D) Lake Titicaca - highest navigable lake

Explanation: Lake Titicaca is the world's highest navigable lake. The Andes is the longest range, Aconcagua is South America's highest peak, and Atacama is the driest desert.

MAINS PRACTICE

Descriptive (Mains) Questions

8 APSC Mains-style questions (10/15/20 marks) with model answers, key points, answer structure and conclusion.

Q1. How do seismic waves help us understand the interior of the Earth? Explain with reference to shadow zones.

10 MARKS

Because we cannot reach the Earth's interior, we rely on indirect evidence, chiefly seismic (earthquake) waves. These are of two kinds: surface waves (Love and Rayleigh) and body waves (P and S). P-waves are fast and pass through both solids and liquids, while S-waves are slower and pass through solids only. As the waves travel through the Earth they bend and, in certain belts, vanish. P-waves are not recorded between 103° and 143° from the focus (the P-wave shadow zone), and S-waves are not recorded beyond 103° (the S-wave shadow zone). The absence of S-waves beyond 103° shows that the outer core must be liquid, since S-waves cannot pass through liquid; later, Lehmann's observation of faster P-waves deep inside revealed a solid inner core.

Key Points

- Seismic waves: surface (L, R) and body (P, S).
- P-waves: solid + liquid; S-waves: solid only.
- P-wave shadow zone 103-143°; S-wave shadow beyond 103°.
- S-shadow proves a liquid outer core.
- Lehmann: solid inner core.

Answer Structure

Introduce indirect sources -> types of waves -> behaviour of P and S waves -> shadow zones -> conclusions about the layers.

Conclusion

Thus the behaviour of seismic waves - especially the shadow zones - is our main window into the Earth's hidden layers, revealing a liquid outer core and a solid inner core.

Q2. Explain the evidence Alfred Wegener gave for his Continental Drift theory, and the main criticisms against it.

10 MARKS

Wegener (1912) proposed that all land was once joined as Pangaea, surrounded by the Panthalassa ocean, and later split into Laurasia and Gondwana. His evidence included the jigsaw fit of continents (Brazil's bulge fits the Gulf of Guinea), matching fossils across now-separate continents (the Glossopteris plant and marsupials), and matching rocks and placer deposits between eastern Brazil and western Africa. However, the theory was criticised: fold mountains and islands exist on eastern coasts too (Great Dividing Range, UK), not all continents fit neatly, similar flora and fauna can arise from similar climates, and the forces Wegener proposed (such as the Moon's pull) are far too weak to move continents.

Key Points

- Pangaea -> Laurasia + Gondwana.
- Jigsaw fit (Brazil-Guinea).
- Fossil evidence (Glossopteris, marsupials).
- Geological/placer-deposit match.
- Criticism: eastern fold mountains, weak forces, climate-based similarity.

Answer Structure

State the theory -> list evidence (fit, fossils, rocks) -> list criticisms -> balanced conclusion.

Conclusion

Although flawed in its mechanism, Wegener's theory was a landmark; its core insight survived and matured into the modern theory of plate tectonics.

Q3. Differentiate between the three stages of a river's cycle of erosion with their characteristic landforms. 10 MARKS

A river passes through three stages as the land's slope decreases. In the youthful stage the river has high energy and erodes mainly vertically and headward, carving V-shaped valleys, waterfalls, gorges and canyons. In the mature stage the slope is gentler, vertical erosion gives way to lateral erosion, and the river begins to meander, producing U-shaped valleys, alluvial fans and ox-bow lakes. In the old stage the slope is almost flat, erosion is minimal and deposition dominates, building deltas, distributaries and levees at the river's mouth.

Key Points

- Youth: vertical erosion - V-valley, waterfalls, gorges.
- Maturity: lateral erosion - meanders, ox-bow lakes.
- Old age: deposition - delta, distributaries, levees.
- Energy and slope decrease downstream.

Answer Structure

Introduce the cycle -> youthful stage -> mature stage -> old stage -> conclude on the erosion-to-deposition shift.

Conclusion

The river's work thus shifts steadily from cutting down (youth) to spreading sideways (maturity) to building up (old age), sculpting a characteristic set of landforms at each stage.

Q4. Describe the major surface ocean currents and explain how they influence climate, deserts and fishing grounds. 15 MARKS

Ocean currents are large masses of sea water moving in a fixed direction, driven by the Earth's rotation, temperature and salinity differences, wind and coastlines. Warm currents carry heat and moisture: the Gulf Stream warms the eastern USA and, continuing as the North Atlantic Drift, keeps European ports ice-free and brings rain to western Europe. Cold currents do the opposite, chilling the air and creating coastal deserts - the Canary current contributes to the Sahara, the Benguela to the Namib, and the Peru (Humboldt) current to the Atacama. Where a warm and a cold current meet, vigorous mixing brings nutrients to the surface and creates great fishing grounds, such as the Grand Bank (Gulf Stream meeting the Labrador current) and the waters off Japan (warm Kuroshio meeting cold Oyashio).

Key Points

- Drivers: rotation, temperature, wind, salinity, coastline.
- Warm currents bring rain (Gulf Stream, North Atlantic Drift).
- Cold currents cause deserts (Canary->Sahara, Peru->Atacama).
- Warm + cold meeting = fishing grounds (Grand Bank, Dogger Bank).
- Examples across oceans.

Answer Structure

Define currents and drivers -> warm currents and climate -> cold currents and deserts -> fishing grounds -> conclude on global importance.

Conclusion

Ocean currents are therefore powerful regulators of world climate, rainfall, deserts and fisheries, shaping where people farm, fish and settle.

Q5. Explain the United Nations Convention on the Law of the Sea (UNCLOS) maritime zones and the rights of a coastal state in each. 15 MARKS

UNCLOS divides the sea into zones measured from the baseline (the low-water line along the coast). Landward of it lie internal waters, over which the state has full sovereignty and where there is no right of innocent passage. The territorial sea extends to 12 nautical miles, where the state has sovereignty over the surface, seabed, subsoil and airspace, limited only by the right of innocent passage. The contiguous zone reaches 24 nm and lets the state enforce its customs, immigration, sanitary and fiscal laws, but only on the surface and floor. The Exclusive Economic Zone extends to 200 nm and grants sovereign rights to explore and use natural resources and to produce energy, but not to block navigation or overflight. Beyond the EEZ are the high seas, the 'common heritage of mankind', open to all for peaceful purposes.

Key Points

- Baseline and internal waters.
- Territorial sea - 12 nm, full sovereignty, innocent passage.
- Contiguous zone - 24 nm, customs/immigration.
- EEZ - 200 nm, resource rights only.
- High seas - common heritage of mankind.

Answer Structure

Define the baseline -> work outward zone by zone with limits and rights -> conclude on the balance of sovereignty and freedom.

Conclusion

UNCLOS thus carefully graduates a state's powers - from full sovereignty near the coast to mere resource rights in the EEZ - balancing national interests against the freedom of the seas.

Q6. What are the world's pressure belts? Explain how they are formed and why they shift. 15 MARKS

Air pressure depends mainly on temperature: warm air is light and rises, creating low pressure, while cold air is heavy and sinks, creating high pressure. This produces seven belts. At the equator, intense heating gives the thermally induced Equatorial Low Pressure Belt. Around 30° N and S, air that rose at the equator sinks, forming the Sub-tropical High. At about 60° N and S the Earth's rotation lifts air to create the dynamically induced Sub-polar Low. At the poles, cold dense air gives the thermally induced Polar High. Because the Sun's vertical rays move between the tropics through the year, all these belts shift north and south with the season.

Key Points

- Warm air -> low pressure; cold air -> high pressure.
- Equatorial Low (thermal, 0°).
- Sub-tropical High (30°, sinking air).
- Sub-polar Low (60°, dynamic).
- Polar High (90°, thermal).
- Belts shift with the Sun's apparent movement.

Answer Structure

Explain the temperature-pressure link -> describe each belt from equator to pole -> thermal vs dynamic -> shifting -> conclude.

Conclusion

The pressure belts, alternating between thermal and dynamic origins, set up the planet's wind systems, and their seasonal shifting helps drive phenomena such as the monsoon and shifting rain belts.

Q7. Discuss the theory of plate tectonics, the types of plate boundaries, and the landforms and hazards associated with each. 10 MARKS

Plate tectonics describes how the rigid plates - each made of the crust and the solid upper mantle - move and adjust over the asthenosphere. There are seven major plates (Pacific, North American, South American, African, Eurasian, Antarctic and Indo-Australian) and several minor ones. Plate edges form two kinds of boundary. At convergent boundaries plates collide: continental-continental convergence crumples sediments into fold mountains (the Himalaya, where the Indian plate subducted under the Eurasian); continental-oceanic convergence subducts the denser oceanic plate, melting rock to feed volcanoes and raising fold mountains (the Andes and Rockies along the Pacific Ring of Fire); and oceanic-oceanic convergence forms trenches and island arcs. These are 'destructive' because crust is consumed. At divergent boundaries plates move apart and rising lava builds ridges, such as the Mid-Atlantic Ridge - 'constructive' boundaries. Convergent zones in particular generate the world's great earthquakes, volcanoes and tsunamis.

Key Points

- Plate = crust + solid upper mantle.
- Seven major plates.
- Convergent: C-C (Himalaya), C-O (Andes), O-O (island arcs).
- Divergent: ridges (Mid-Atlantic).
- Hazards: earthquakes, volcanoes, tsunamis.
- Convergent destructive, divergent constructive.

Answer Structure

Define plate tectonics -> major plates -> convergent sub-types with examples -> divergent boundary -> associated hazards -> conclude.

Conclusion

Plate tectonics thus unifies the formation of mountains, ocean ridges and trenches with the distribution of earthquakes and volcanoes, explaining the restless face of the Earth.

Q8. Explain the vertical structure of the atmosphere and the significance of each layer, and discuss why the Earth experiences seasons. 10 MARKS

The atmosphere is layered because gravity holds heavier gases low and temperature varies with height. The troposphere (0-18 km) holds all weather and cools at the normal lapse rate of about 1°C per 165 m. Above it the stratosphere (to 50 km) is dry, smooth for flights, and contains the ozone layer that absorbs harmful UV radiation. The mesosphere (to 80 km) is the coldest layer, where meteors burn up. The thermosphere or ionosphere (80-400 km) contains charged ions that reflect radio waves, enabling long-distance broadcasting. Beyond lies the exosphere, fading into space. Seasons, meanwhile, arise from two facts together: the Earth's revolution around the Sun and its fixed axial tilt of about 23.5°. On 21 June the Sun is overhead at the Tropic of Cancer (Northern summer solstice); on 22 December it is overhead at the Tropic of Capricorn (Southern summer); and on 21 March and 23 September it is overhead at the equator, giving equal day and night (equinoxes).

Key Points

- Troposphere - weather, normal lapse rate.
- Stratosphere - ozone, smooth flight.
- Mesosphere - coldest, meteors burn.
- Thermosphere/Ionosphere - radio reflection.
- Exosphere - outermost.
- Seasons: revolution + axial tilt; solstices & equinoxes.

Answer Structure

Layer-by-layer description with significance -> link to seasons -> solstices/equinoxes -> conclude.

Conclusion

Thus the atmosphere's layered structure protects and sustains life, while the combination of the Earth's tilt and revolution gives us the rhythm of the seasons.